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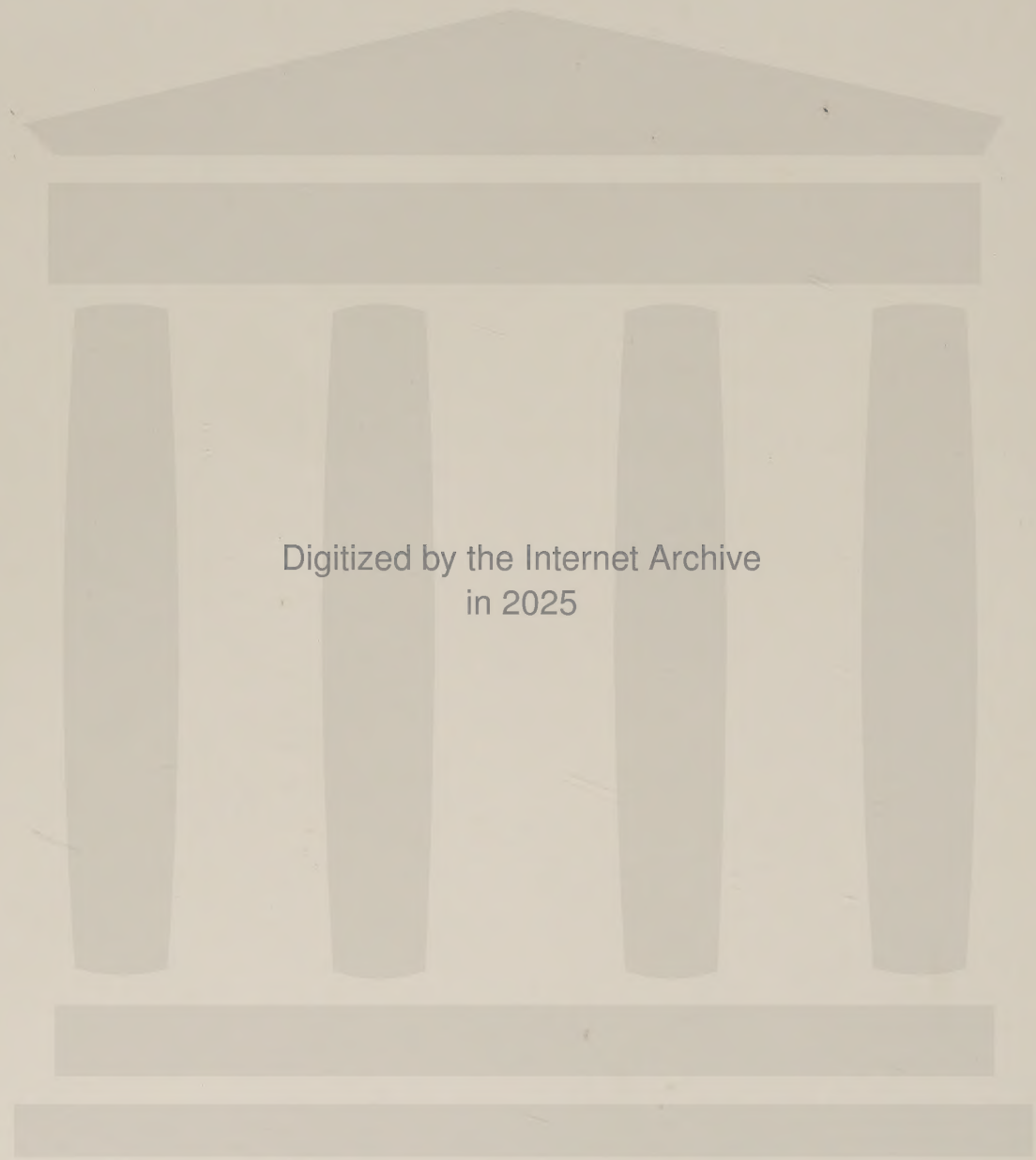
INDO-PACIFIC FISHERY COMMISSION

Report of the ninth session of the

WORKING PARTY ON FISH TECHNOLOGY AND MARKETING

Cochin, India, 7-9 March 1994

Food and Agriculture Organization of the United Nations



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INDO-PACIFIC FISHERY COMMISSION

REPORT OF THE NINTH SESSION OF THE INDO-PACIFIC FISHERY COMMISSION WORKING PARTY ON FISH TECHNOLOGY AND MARKETING

Cochin, India, 7-9 March 1994

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome 1995

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PREPARATION OF THIS DOCUMENT

The Report of the Ninth Session of the IPFC Working Party on Fish Technology and Marketing, Cochin, India, 7-9 March 1994, has been prepared for the consideration of the 66th Session of the Asian-Pacific Fishery Commission (APFIC) Executive Committee. The research papers presented at the Session will be published as a supplement to this report.

Distribution

FAO Fisheries Department
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ABSTRACT

The Ninth Session of the Indo-Pacific Fishery Commission Working Party on Fish Technology was held at the Central Institute of Fishery Technology, Cochin, India, from 7-9 March 1994, at the invitation of the Government of India.

The report reviews progress with fish technology research in the IPFC region and the collaboration between institutes. It also provides the abstracts of the 30 research contributions presented at the meeting. These will be published in full as a supplement to the report.

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Opening of the Meeting

1. The meeting was held at the invitation of the Government of India at the Central Institute of Fishery Technology (CIFT) Cochin, India, from 7 to 9 March 1994. Dr K Gopakumar, Director, CIFT, welcomed the participants and Smt M T Padma, Hon. Minister for Fisheries Government of Kerala, gave an inaugural address. Mr K B Pillai, Chairman MPEDA, and Mr C Cherian, President, Seafood Exporters, also addressed the meeting. On behalf of Mr Jacques Diouf, Director General of FAO, the Technical Secretary of the Working Party, Mr David James, thanked the Government of India for hosting the session and noted with appreciation the interest shown by the Kerala State Government.

2. The major part of the meeting was devoted to the presentation and discussion of papers and research reports arising from the Working Party's programme, under the following general categories:

   Shrimp microbiology
   Fish microbiology
   Storage studies
   Product development
   Miscellaneous

3. Two other meetings of significant interest to Asian fish technologists were held together with the Working Party, which enabled a considerably larger group to meet and exchange ideas. Senior fish technologists from the region attended a workshop to establish priorities for fish technology research. This workshop was convened as part of the Strategy for International Fisheries Research, which is following up on the earlier study, and was funded by the Overseas Development Administration of the UK. It was organised by the Natural Resources Institute, also of the UK. The other meeting involved the participants of the European Union STD3 Project on Utilization of Low-value Fish which links six institutes in Asia with three from Europe. In all there were 48 participants and observers who are listed in Appendix A.

4. Following a progress report by the Technical Secretary, Mr David James of FAO, the meeting proceeded to the presentation and discussion of the 26 research contributions. The abstracts of these are contained in this report; while the full texts will be edited and printed as a supplement to the report. The final session was devoted to discussion of the future programme of the Working Party and on ways to strengthen fish technology research in the region.

Progress Report by Technical Secretary

5. The Technical Secretary updated the group on some activities of FAO since the last meeting in Yogyakarta, Indonesia. FAO is still actively involved in the follow-up to the Strategy on International Fisheries Research (SIFR) and is represented on the Steering Committee. Funding from the World Bank and the UNDP has been provided for a small Secretariat and an Executive Secretary is

now in post at the IDRC in Ottawa, Canada. In recognition that the development of the Strategy had largely been donor driven, the first phase of the follow-up is a process of consultation with participating developing countries to obtain a view of their priorities. To this end FAO had been instrumental in organising a series of workshops in Africa to determine priorities for research in aquaculture. These were almost complete and it is hoped to continue in Asia and Latin America. In January 1994 a Regional Workshop on Fishery Information and Statistics in Asia was held in Bangkok, jointly by SEAFDEC, SIFR and FAO. The report, giving details of the specific needs, is awaited. The Workshop on post-harvest research priorities in Asia to be held after the Working Party meeting, with ODA funding, would be an opportunity to articulate the needs of this region. Issues relating to the SIFR are expected to be discussed at the Third Fishery Development Donors Consultation which will be held in Paris in April 1994. Although it is hoped that donor coordination, together with better information, would result in more funds for research, there are as yet no positive indications. In this regard the Bay of Bengal Committee had taken an interesting initiative in setting up a Sub-group to consult with governments on the desires for and viability of regional research programmes. Early indications are that a strong justification is expressed for such programmes but that there is an equally strong desire that the programmes should be owned by the region and not depend on donor funding.

6. FAO is in the process of preparing a Code of Conduct for Responsible Fishing at the request of its member governments. The Code will be advisory, as is the case with the FAO/WHO Codex Alimentarius Codes of Practice. The activity will take some time but the intention is to provide a document that will assist governments to better manage their fisheries in a sustainable manner. In addition to articles on Fisheries Management, Fishing Operations, Aquaculture and Integrated Coastal Area Management, there will also be articles on Post-harvest Practices and Marketing and Fisheries Research. It is expected that the final version will be presented to the FAO Committee on Fisheries in about twelve months time.

7. In 1993 FAO convened a meeting of people engaged in research into the variations in abundance of small pelagic species. These resources are prolific in the world's upwelling areas and make a major contribution both to human nutrition and to animal feed. However, they are affected by long term variations in abundance that have been shown to be climate driven. There is a great deal of research in the fields of oceanography and climate change ongoing but very little on socio-economic or utilization issues. Understanding the mechanisms behind the variability should enable prediction of future abundance which would be of considerable economic interest to the industry and to government planners. It is hoped that in a few years time there will be an opportunity to hold an international meeting on the issues, including the socio-economic and utilization aspects.

8. In April 1994 FAO will hold an Expert Consultation on Fisheries Research where a group of experts from all aspects of fisheries will discuss the role of FAO in research and make recommendations on the areas of concentration. This meeting is a forerunner to the establishment of the Advisory Committee on Fisheries Research (ACFR) which has replaced the earlier Advisory Committee on Marine

Resources Research (ACMRR) in an attempt to broaden the coverage. It is anticipated that the April meeting will discuss FAO's role in the following broad fisheries research areas:

Global and regional analysis of fishery data and statistics;
A food policy for fisheries;
Small pelagic species for direct human consumption;
Constraints to aquaculture and enhancement;
Research required to follow-up on UNCED and
Research as a component of the Code of Conduct for Responsible Fisheries.

Discussion and Conclusions

9. Following the presentation of the research contributions there was a broad ranging discussion on the current needs for post-harvest research in the region, the future role of the Working Party and how networking and communication between institutes and individuals could be improved.

10. The rapid growth of aquaculture and the tendency to very intensive production had implications for the safety and quality of the products as well as for the environment. There is a need for more information on the ecology of pathogens in tropical aquaculture as this is an important component of ecosystem management. Public health aspects linked to pond dynamics, within the context of coastal zone management, require a holistic approach to integrate the knowledge of all those involved. In the future there will probably be a need to review the microbiological standards for cultured fish and shellfish as well as to monitor both production and the production environment from a public health standpoint.

11. It is evident that shrimp aquaculture technology is changing towards closed circulation systems as a result of environmental pressure. These technological developments will have to be carefully monitored, from the direct public health point of view, in terms of product quality and safety. It will also be necessary to search for indicators of environmental health.

12. There are possibilities for the control of bacteria of public health or fish health significance through the addition of lactic acid bacteria to the feed rather than the use of antibiotics. This is so far an under-researched topic worthy of more attention.

13. Quality assurance using the Hazard Analysis Critical Control Point (HACCP) theory is now widespread and is in use in most Asian countries. However, there is a lack of understanding about implementation which should be followed up by technological institutes. HACCP systems should go right back to production, whether from aquaculture or capture, and not only be thought of as in-plant systems. In addition to the needs for more extension and training activity in the HACCP field there is also a strong requirement for more research support.

14. A question was raised on the relevance of current histamine standards to prevent scombrotoxicosis. There was a general feeling that more work was required.

15. The need for diversification of research, making it more field based in order to solve real problems, was noted. It was suggested that a greater involvement of the university sector would be advantageous as it would bring in more young scientists. However, there is the ever present problem of securing funding.

16. The perennial problem of access to research information was discussed and linked to the SEAFDEC/SIFR/FAO Workshop on Fishery Information Needs in the hope that the post-harvest sector would not be neglected. The Working Party renewed its request for the continuation of Fish Tech News as well as for consideration of publication of some post-harvest current contents tables. An alternative would be to give better coverage to post-harvest matters in Aquatic Science and Fisheries Abstracts (ASFA) or Fisheries and Aquaculture Contents Tables (FACT). However, it was considered that trying to launch a regional post-harvest journal would not be possible because of the high costs and the lack of a sponsor. This was particularly true in view of the availability of both the ASEAN Food Journal and Fishery Technology in the region. Scientists should be encouraged to publish in these journals. At the same time institutes in the region were recommended to investigate connection to the Internet in order to build effective networks through electronic mail.

17. It was agreed that the current terms of reference and programme of the Working Party should continue and that the 10th session should be held in the next FAO biennium, if possible in early 1996. Shri Lanka was tentatively suggested as the location. It was also noted that there would be opportunities for members of the Working Party to meet and exchange information in the interim period through involvement in the EU funded STD3 project.

18. The following section lists the research contributions to the meeting and provides the abstracts. The full papers will be printed as a supplement to this report.

ABSTRACTS

NINTH SESSION OF IPFC WORKING PARTY ON FISH TECHNOLOGY AND MARKETING

LIST OF RESEARCH CONTRIBUTIONS

1. Microbial Profile of Cultured Fish and Prawns Viz a Viz Their Spoilage and Contamination. P.K. Surendran, Nirmala Thampuran and K. Gopakumar. Central Institute of Fisheries Technology, Matsypauri P.O., Cochin-682029, India

2. Microbiology of Cultured Shrimp in India. Nayyar Ahamad, I. Karunasagar and I. Karunasagar. University of Agricultural Sciences, College of Fisheries, Mangalore 575002, India.

3. Occurrence of Antibiotic-Resistant Human-Pathogens in Integrated Fish Farms. D.R. Twiddy and P.J.A. Reilly. Natural Resources Institute, Central Avenue, Chatham Maritime, Chatham, Kent, United Kingdom.

4. Incidence and Viability of *L. Monocytogenes* in Seafood Handling and Processing. T.S.G. Iyer, P.R.G. Varman and K. Gopakumar. Central Institute of Fisheries Technology, Cochin-682 029, India.

5. Biopreservation of Fish Products. Hans Henrik Huss, Lone Gram and Vibeke From Jeppesen. Technological Laboratory of the Danish Ministry of Fisheries, Technical University Bldg. 221, DK-2800 Lyngby, Denmark.

6. Ribotyping of *Salmonella* Isolated from Farm Shrimp. T.S.G. Fonseka. National Aquatic Resources Agency, Crow Island, Colombo 15, Sri Lanka.

7. Staphylococcal Enterotoxins, Enterotoxigenic Staphylococci and Frozen Fish Products. S. Sanjeev and P.K. Surendran. Central Institute of Fisheries Technology, Cochin-682029, India.

8. Influence of Environment on the Microbiological Quality of Cultured Shrimp. Sunarya, Budisusilowati and Ennatha Sri Haryani. NCFQCPT Jakarta, Indonesia.

9. Influence of Certain Parameters in the Lactic Fermentation of Underutilized Fish. T. Jawahar Abraham, S.A. Shanmugam and P. Jeyachandran. Department of Fish Processing Technology, Fisheries College and Research Institute, Tamil Nadu Veterinary and Animal Sciences University, Tuticorin - 628 088, India.

10. Improvements and Development of Fermented Fish Products. Asbjorn Gildberg.

11. Microbial and Biochemical Changes During the Fish Sauce Fermentation. K.V. Lalitha, A. Lakshmi Nair, P.K. Surendran & K. Gopakumar. Central Institute of Fisheries Technology, Cochin-682029, India.

12. Fish Lipid Activities at FF - An Overview with an Emphasis on Analytical Procedures. Benny Jensen. Technological Laboratory, Danish Ministry of Fisheries, Bldg. 221, DK 2800, Lyngby, Denmark.

13. The Effect of Season on Fat Content and Fatty Acid Profile of Yellowfin Tuna. Sunarya, Mufidah Fitriati and Hendarni Mulyani. NCFQCPTD Jakarta, Indonesia.

14. Production and Quality of Indonesian Fish Oil: Case Study in Muncar (East Java) and Bali. Hari Eko Irianto. Research Staff at the Slipi Research Station for Marine Fisheries. Jln. Petamburan VI, Jakarta 10260, Indonesia.

15. Storage of Farm Shrimp (*Penaeus Monodon*) in Ice and at Ambient Temperature. T.S.G. Fonseka & I.V. Ranjini. National Aquatic Resources Agency, Crow Island, Colombo 15, Sri Lanka.

16. Effect of Storage Temperature on the Keeping Quality of Frozen Mackerel (*Rastrelliger kanagurta*). Chinnamma George, V. Muraleedharan, P.A. Perigreen and K. Gopakumar. Central Institute of Fisheries Technology, Cochin-682 029, Kerala, India.

17. Study on the Technology for Chilled Tuna Sashimi Blocks. Sunarya, Nazory Djazuli, Surono and Abdul Rachman. NCFQCPTD Jakarta, Indonesia.

18. Changes in In-Vitro and In-Vivo Digestibility of Mackerel on Canning and Drying. M.R. Raghunath, K. Ammu, T.V. Shankar and K. Devadasan. CIFT, Cochin, India.

19. Digestibility and Hypocholesterolemic Effect of Chitin and Chitosan in Albino Rats. P.T. Mathew, K.G. Ramachandran Nair & P. Madhavan. Central Institute of Fisheries Technology, Matsyapuri P.O., Cochin-682029, India.

20. Elimination of Pathogenic Bacteria in Smoked Mackerel. Pongpen Rattagool, Somchai Roongirathananon, Bandon Chotikan, Wisan Sansing, Kullakarn Rattagool. Fish Technology Development Division, Bangkok, Thailand.

21. Utilization of Cawtail Ray Meat for Kamaboko Manufacture. Hari Eko Irianto, M. Theresia Kamallan, Suyuti Nasran and Yusro Nuri Fawzya. RSMF Jakarta, Indonesia.

22. Extension of the Shelf Life of Ambul Thiyal. B.D.Y. Amarasinghe and V. Jayaweera. National Aquatic Resources Agency, Crow Island, Mattakkuliya, Colombo 15, Sri Lanka.

23. Improvement of Quality of Dried Smoked Sea Cucumber by Enzymic Treatment. R. Peranginangin, E. Setiabudi, Murniayati and Suparno. RSMF Jakarta, Indonesia.

24. Studies on the Preparation of Shrimp Pickles in Different Style and Their Acceptability. K. Rathnakumar, S.A. Shanmugam, T. Jawahar Abraham & P. Jeyachandran. Department of Fish Processing Technology, Fisheries College and Research Institute, Tamil Nadu Veterinary and Animal Sciences University, Tuticorin - 628 008, India.

25. Collagen Breakdown in Tilapia - Thermal Characteristics and Solubility of Type I and Type V Collagen. Catherine Turner and John Ryder.

26. Processing of Aquatic Food Products for 2000 AD in India. M.K.R. Nair and S. Girija. Integrated Fisheries Project, Cochin, India.

27. Influence of Cryoprotectants on the Quality of Frozen Minced Threadfin Bream *Nemipterus Bleckeri* During Frozen Storage. G. Indra Jasmine, A. Margaret Muthu Rathinam, K. Rathnakumar and P. Jeyachandran. Department of Fish Processing Technology, Fisheries College & Research Institute, Tuticorn - 628 008.

28. Utilization of Whey Protein Concentrate and Carrageenan in Fishball Processing. Yu Swee Yean. Faculty of Food Science & Biotechnology, Universiti Pertanian Malaysia, 43400 UPM, Serdang, Selangor, Malaysia.

29. Extraction of Agar from Seaweed. P.S. Jayasinghe and C. Jayasinghe. National Aquatic Resources Agency, Crow Island, Colombo 15, Sri Lanka.

30. Women in the Fisheries Programme of Papua New Guinea. P.J. Cecily, Department of Fisheries and Marine Resources, Papua New Guinea.

MICROBIAL PROFILE OF CULTURED FISH AND PRAWNS VIZ A VIZ THEIR SPOILAGE AND CONTAMINATION

By

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ABSTRACT

The microbial load on freshly caught cultured fish and prawns differed significantly from those of the marine environment, quantitatively as well as qualitatively. The difference in the various physiological groups of bacteria from marine, brackish and freshwater fish reflected on their shelf-life in ice. A very significant observation in the case of the freshwater fishes rohu and mrigal is that while *Pseudomonas* species gained dominance over other bacterial species, spoilage odours were conspicuously lacking. This finding points to the possibility that unlike marine fish, the role of bacteria in the spoilage of cultured fish is rather limited. Compared to fresh and brackish water fish, marine fish harboured a lesser proportion of bacteria belonging to *Enterobacteriaceae*. Also the count of coliforms and faecal coliforms were much higher in cultured prawn than fish. Greater incidence of bacteria of faecal origin is a problem of post-harvest contamination in marine fish and prawns while it is a natural contaminant in cultured species. This aspect should be taken into consideration while setting bacteriological limits for cultured fish and prawn. Since iced cultured fish stay longer in fresh condition than marine fish, there is greater scope for them to serve as raw material for production of other value added products.

MICROBIOLOGY OF CULTURED SHRIMP IN INDIA

By

Nayyar Ahamad, I. Karunasagar and I. Karunasagar
University of Agricultural Sciences, College of Fisheries,
Mangalore 575002, India

The microbial load of water, sediment and cultured shrimp was studied. Analysis was made for potential pathogens like *V. cholerae, V. parahaemolyticus, V. vulnificus, Salmonella, Listeria* and for indicator organisms in shrimp surface and shrimp gut. The results suggest that potentially pathogenic vibrios could be normal inhabitants of the gut of

cultured shrimp. *Salmonella paratyphi* could be isolated from the sediment of a shrimp culture pond even when faecal coliform count in the water and sediment were low. *Salmonella* could also be isolated from the gut of marine shrimp in the region suggesting that *Salmonella* could survive in coastal sediments and could be present in shrimp before any preprocess handling.

OCCURRENCE OF ANTIBIOTIC-RESISTANT HUMAN-PATHOGENS IN INTEGRATED FISH FARMS

By

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Chatham, Kent, United Kingdom

ABSTRACT

The occurrence of antibiotic-resistant pathogenic-bacteria in integrated fish farms was studied in a Southeast Asian country. A total of nine fish ponds were sampled for *Salmonella, Vibrios, Aeromonas* and *Plesiomonas*. *Salmonella spp.* were present in 28% of samples of fish, pond sediment and pond water, *Aeromonas hydrophila* in 67% of samples of fish, *Plesiomonas shigelloides* in 22% samples of fish and *Vibrio parahaemolyticus* in 11% of the samples of fish, sediment and water. *Vibrio cholerae* was not found in any of the samples of fish, pond sediment or pond water. Results showed that significant levels of antibiotic-resistant pathogenic-bacteria occur in aquaculture ponds where antibiotics are routinely incorporated into animal feeds. Antibiotic-resistant strains of *Salmonella, Aeromonas hydrophila* and *Plesiomonas shigelloides* were isolated from fish samples. Of the 118 microorganisms isolated and tested during the study, 11% were resistant to nalidixic acid, 12% to oxolinic acid, 17% to chloramphenicol, 6% to neomycin, 74% to oxytetracycline, 75% to tetracycline, 47% to furazolidone and 25% to sulphamethoxazole combined with trimethoprim. Plasmids were detected in a strain of *Salmonella*, other members of the Enterobacteriaceae and several Pseudomonas species. Health risks and implications associated with these findings are discussed.

INCIDENCE AND VIABILITY OF *L. MONOCYTOGENES* IN SEAFOOD HANDLING AND PROCESSING

By

T.S.G. Iyer, P.R.G. Varman and K. Gopakumar
Central Institute of Fisheries Technology
Cochin-682 029, India

ABSTRACT

Listeria monocytogenes was absent in all the 361 samples of frozen shrimps presented for export. The organism survives freezing and further storage at -18°C for over two years. In water *L. monocytogenes* survives 10-30 days at room temperature (28-30°C) and 70-110 days at refrigerated temperature (5-10°C) depending upon the initial load in the water sample. The process water in the seafood processing factories must be chlorinated to a residual level of 10 ppm. to get full protection against *L. monocytogenes*.

BIOPRESERVATION OF FISH PRODUCTS

By

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ABSTRACT

Recent approaches in preservation technology are directed towards alternative preservation offered by natural or biological systems or combinations of biological systems with a much reduced use of salt and chemical additives. This being in line with trends in consumer and industry demands for food products with less chemical preservatives. Efforts have concentrated on identification and development of protective bacterial cultures with antimicrobial effect against known pathogens (particularly *Listeria monocytogenes*) and spoilage organisms. The metabolites from such bacterial cultures, particularly the bacteriocins have also been suggested as food preservatives and have been intensively studied. In addition, the use of other bacteriocin-like peptides and food grade enzyme systems, e.g. lysozyme, is being evaluated in biopreservation.

Our group has been working with biopreservation of fish products for several years. The various antimicrobial systems investigated the methods used and the main results will be presented along with thoughts on future developments in this area.

RIBOTYPING OF *SALMONELLA* ISOLATED FROM FARM SHRIMP

By

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National Aquatic Resources Agency
Crow Island, Colombo 15, Sri Lanka

Shrimp (*Penaeus monodon*) samples were obtained from farms at harvest and subsequently during processing. More samples of pond water and shrimp feed were also obtained. All these samples were examined for *Salmonella* and ten isolates were obtained during this study. Eight of these isolates were from farm shrimp after harvest and the other two were from the processed product.

These isolates had low plasmid carriage rate (10%) and plasmid profiling was not useful in strain differentiation. Genomic DNA was extracted and digested using three restriction enzymes, namely *Hpall, Hindll* and *EcoRI*. Ribotyping of *EcoRI* digest produced fingerprints which were most useful in strain differentiation and aided in tracing the sites of cross-contamination. Only this mode of strain differentiation was helpful in detection of contamination of a farm to two sources. API profile types were useful but to a lesser extent but plasmid profiling was of very limited value in this instance. Ribotyping seems to show a vast potential as a tool in food microbiology in the near future.

STAPHYLOCOCCAL ENTEROTOXINS, ENTEROTOXIGENIC STAPHYLOCOCCI AND FROZEN FISH PRODUCTS

By

S. Sanjeev and P.K. Surendran
Central Institute of Fisheries Technology
Cochin-682029, India

ABSTRACT

One hundred and eight frozen fish products consisting of cooked, picked crab meat, prawns and ready to fry fish cutlets collected from cold stores situated in and around Cochin were examined for staphylococcal enterotoxin A, B, C, D and enterotoxigenic staphylococci. All the frozen fish products were found free from enterotoxins. *Stayphylococcus aureus* was isolated from eighty six samples (79.63%) and its load varied from 55 to 1.1 x 10^6 CFU/g. Ninety-eight *Staph. aureus* strains out of one hundred and forty strains tested were found to be enterotoxigenic and they produced enterotoxins A, B, C and D either singly or in combinations. RPLA method was used for the detection of enterotoxins and the enterotoxigenicity of *Staph. aureus* isolates. Fish products and *Staph. aureus* isolates were not tested for enterotoxin E in this study because the RPLA kit does not contain the reagents for its testing. Enterotoxin A and D were detected more often than others. Seventy-four samples contained (68.52%) enterotoxigenic staphylococci.

INFLUENCE OF THE ENVIRONMENT ON THE MICROBIOLOGICAL QUALITY (*VIBRIO PARAHAEMOLITICUS* AND *SALMONELLA*) OF CULTURED SHRIMP

By

Sunarya, Budisusilowati and Ennatha Sri Haryani
National Centre for Fish Quality Control and Processing Technology
Development, Directorate General of Fisheries,
Jakarta, Indonesia

Microbiological quality of shrimp is the major problem in the world market during the last two decades particularly in relation to food safety. Pathogenic microorganisms usually found in shrimp are: *E. coli, Salmonella, Vibrio cholerae, vibrio parahaemoliticus, Staphylococcus aureus* and possibly *Listeria monocitogenes.*

Many scientists conclude that marine shrimp do not naturally contain pathogenic microorganisms, but that contamination during handling and processing are the main vectors. This may be different for cultured shrimp, where environmental conditions, particularly that of water quality and feed and chemical use probably plays an important factor in the initial contamination. However, the presence of natural pathogenic microorganisms, especially *Salmonella*, in cultured shrimp is still in question.

This survey aimed at finding more data and information, in order to answer the question.

INFLUENCE OF CERTAIN PARAMETERS IN THE LACTIC FERMENTATION OF UNDERUTILIZED FISH

By

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Department of Fish Processing Technology
Fisheries College and Research Institute
Tamil Nadu Veterinary and Animal Sciences University
Tuticorin - 628 088, India

ABSTRACT

Studies were conducted to evaluate the parameters that favour a rapid lactic fermentation in fish - salt - carbohydrate mixture. The initial pH and textural characteristics of meat markedly affected the period of fermentation. Higher concentrations of salt decreased the rate of acid production and pH reduction in meat as well as in liquid medium. There was no significant difference in the rate of fermentation, when glucose or sucrose was used as fermentable carbohydrate source for *Lactobacillus plantarum*.

IMPROVEMENTS AND DEVELOPMENTS OF FERMENTED FISH PRODUCTS

By

Asbjørn Gildberg
Norwegian Institute of Fisheries and Aquaculture

ABSTRACT

During centuries a great pool of knowledge about traditional fish fermentation has accumulated, but so far little has been done to improve traditional methods to yield products with safety and stability that meet modern international standards. Due to the growing scepticism towards chemical preservatives, the demand for biopreservation methods is increasing. To meet this demand efforts should be made to develop safe methods for the preparation of standardized fermented fish products for new potential markets. The present paper reviews recent developments within this field and indicates some important topics for future research and development.

MICROBIAL AND BIOCHEMICAL CHANGES DURING THE FISH SAUCE FERMENTATION

By

K.V. Lalitha, A. Lakshmi Nair, P.K. Surendran & K. Gopakumar
Central Institute of Fisheries Technology
Cochin-682029, India

ABSTRACT

Microbial and biochemical changes in three samples of high salt fermented fish sauce were evaluated. All samples showed lowering of pH. While the concentration of salt decreased after the first month, the total solids, total nitrogen, trimethylamine and total voiatile base increased with storage. Results of quantitative microbiological analysis revealed a significant number of viable bacteria were present in all the three sauces only during the first three weeks of fermentation. Qualitative analysis showed a gradual reduction of the Gram negative bacteria after two weeks of fermentation. Gram positive bacteria especially Bacillus predominated in the microflora. Low numbers of halophilic microorganisms were found throughout the fermentation process. The halophilic isolates were found to be yeasts -

Debaryomyces hansenii. Lactic acid bacteria were not found during fermentation, presumably inhibited by the high salt concentration in the environment.

FISH LIPID ACTIVITIES AT FF - AN OVERVIEW WITH AN EMPHASIS ON ANALYTICAL PROCEDURES

By

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ABSTRACT

At the Technological Laboratory of the Danish Ministry of Fisheries (FF is the Danish acronym) several activities in the fields of fish lipids and lipid oxidation are in progress. A majority of these are related to the fish oil project. In this project the goal is the production of a high quality fish oil, suitable for food uses. Traditional oil quality parameters are being followed. The effects of ways of stabilization are being studied, using both accelerated tests and long-term storage of oils and emulsions, and assessing the quality by chemical and sensory methods. A screening of fat content and lipid composition of low-value fish species has been carried out to estimate the effect of season, catching ground and species on these parameters. An HPLC-method for assessing the polymer content of fish oil has been implemented. Instrumental evaluation of some of the sensory characters of oxidizing fish oil is being attempted, using variations of headspace analytical methods. For studies of quality deterioration in fresh and frozen fish, analyses of lipid hydrolysis have been carried out.

In this outline the procedures, a few results, and specific references to the activities at FF will be given.

THE EFFECT OF SEASON ON FAT CONTENT AND FATTY ACID PROFILE OF YELLOWFIN TUNA

By

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ABSTRACT

The effect of season on fat content and fatty acid profile especially n-3 on yellowfin tuna has been investigated. The fish were caught from North Sulawesi (Pacific Ocean) and Bali (Indonesian Ocean) and were analyzed every month from January to December 1992.

The fat content of yellowfin tuna caught from Bali waters were in the range of 2.55% - 7.03% and this value shows that the season did not significantly affect the fat content, whereas fish caught from North Sulawesi have fat content between 1.99% to 11.12% where were significantly affected by season.

Fatty acid profile of fish were analyzed by gas liquid chromatography. The result shows that the average percentage of n-3 fatty acids to total fatty acid content on the fish caught from Bali waters was higher (37.37%) compared to that of fish caught from North Sulawesi waters (30.36%).

The n-3 fatty acids on these yellowfin tuna has been found to be dominated by docosa hexanoic acid (DHA/C22:6 n-3). About 29.9% of DHA was found on fish caught from Bali waters and 24.72% on the fish caught from North Sulawesi. The DHA is more affected by season compared with other n-3 fatty acid including eicosa pentanoic acid (EPA/C 20:5 n-3).

PRODUCTION AND QUALITY OF INDONESIAN FISH OIL: CASE STUDY IN MUNCAR (EAST JAVA) AND BALI

By

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ABSTRACT

A survey of production and quality of Indonesian fish oil was carried out in Muncar and Bali. Thirteen fish oil producers in Muncar and six fish oil producers in Bali participated. The results indicated that fish oil could be obtained from fish meal processing and the cooking step in canned fish processing. Raw materials used by fish meal processors producing fish oil are whole fish and fish waste which were mainly oil sardine. Mostly, the fish oils were sold at Rp. 201-300, and the main buyers were local fish oil traders and animal feed companies.

The fish oil quality varied chemically and physically. However, the fish oils collected from canning waste were of a better quality than oil obtained from the fish meal processing. The omega-3 fatty acid of Indonesian fish oil was found to be relatively high at 20.6-29.5% of total fatty acids.

STORAGE OF FARM SHRIMP (*PENAEUS MONODON*) IN ICE AND AT AMBIENT TEMPERATURE

By

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The shelf-life of farm shrimp (*Penaeus monodon*) was studied at ambient temperature and in ice. Microbiological, chemical and organoleptic testing were used to assess the shrimp subjected to this study. At ambient temperature shrimp were rejected after 12 hours while the shrimp held in ice were rejected after 15 days storage. Melanosis, offensive sulphide smell, loose shell and bland taste were the reasons commonly attributed for these rejections. Shrimp had total bacterial counts over 10^7/g at rejection irrespective of the storage

temperatures of the two trials. The pH tended to increase from 6.7 to 7.2 for shrimp at ambient storage while in ice shrimp were not acceptable above pH value 7.3. Increase of indole was sharp for ambient stored shrimp indicating its significance as a parameter of temperature abuse.

EFFECT OF STORAGE TEMPERATURE ON THE KEEPING QUALITY OF FROZEN MACKEREL (*RASTRELLIGER KANAGURTA*)

By

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Quick frozen mackerel (*Rastrelliger kanagurta*) stored at -10°C, -20°C and -30°C revealed that, as the storage temperature was lowered, a proportional extension of shelf-life was obtained. Development of rancidity was found to be a limiting factor for acceptability when assessed by sensory and chemical parameters like free fatty acid and thiobarbituric acid value. Only slight variation occurred in water extractable nitrogen, free α-amino nitrogen and total volatile nitrogen during frozen storage. Lactic acid formation was very rapid in mackerel indicating high glycolytic activity. At the end of 5 months storage the sample stored at -10°C had a 15 times higher TBA value than that stored at -30°C. TBA value started to increase from the initial stationary phase after 6 months storage in the sample stored at -20°C and after 9 months in the sample stored at -30°C. Frozen mackerel stored at -30°C had a shelf-life of more than 9 months provided the material is glazed and packed in moisture proof packaging material.

STUDY ON THE TECHNOLOGY FOR CHILLED TUNA SASHIMI BLOCKS

By

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ABSTRACT

A study on the technology of chilled tuna loin for "sashimi" and "sushi", and its shelf-life was carried out. The raw material used was yellowfin tuna (*Thunnus albacores*). The fish was processed into quarter blocks, then kept at 0 - 5°C by packing with ice in a styrofoam container. The quality of tuna was determined by measuring K-value, total viable count (TVC) of bacteria and sensory evaluation. The results show clearly that quarter tuna blocks were acceptable for sashimi and sushi with initial score of sensory evaluation 47.3; K-Value 11% and TVC 8.3 X 103. The shelf life of the product during icing at 0 - 5°C was 14 days.

Export of fresh tuna from Indonesia has increased considerably in the past five years reaching 14,018 tons in 1990 compared to 2,311 tons in 1987 (Directorate General of Fisheries, 1991). In Japan this product is consumed as "sashimi" and "sushi". Until now this product was exported whole instead of "loins" which is the way it is sold at retail level in importing countries such as Japan and Hawaii (US).

In order to increase the added value of this product, it is better to export this product as loin. This study investigated the temperature of loin tuna packed in styrofoam box with variable ratio of ice and the shelf-life of chilled loin tuna packed in styrofoam box at 0 - 5°C.

CHANGES IN IN-VITRO AND IN-VIVO DIGESTIBILITY OF MACKEREL ON CANNING AND DRYING

By

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Running Title: Digestibility changes upon drying

ABSTRACT

Indian mackerel (*Rastrelliger kanagurta*) was cured in saturated brine and dried at 50°C. The dried fish was desalted (rehydrated) and cooked in steam, as were the fresh fish. Digestibility studies were carried out on these two samples using pepsin, trypsin, chymotrypsin, bromelin, alcalase and neutrase for *in vitro* studies, and male albino rates for *in vivo* studies. Enzyme digestibility was found to suffer as a result of the curing and drying process in all enzymes with the degree of decrease in the following order: Trypsin > pepsin > neutrase > bromelin > alcalase > chymotrypsin. In animals, decrease in the digestibility of the dried fish protein was highly significant and the utilization and retention of the proteins were also significantly affected. But the difference in PER between the fresh and dried proteins was not significant. Amino nitrogen in the enzymatic digests determined by the trinitrobenzene sulphonic acid reaction was found to be highly correlated to the total nitrogen in digest determined by the Kjeldahl procedure.

DIGESTIBILITY AND HYPOCHOLESTEROLEMIC EFFECT OF CHITIN AND CHITOSAN IN ALBINO RATS

By

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ABSTRACT

Chitin and chitosan prepared from prawn head and shell waste were incorporated in the diets of albino rats (Wistar strain) at 0.5% and 1.0% level and fed for a period of 13 weeks. At the end of the experimental feeding period, the cholesterol contents in the internal organs and serum were less in the chitin and chitosan fed animals compared to the control. The hypocholesterolemic effect was more significant in the serum than in the internal organs. This effect was more pronounced with chitosan than chitin.

ELIMINATION OF PATHOGENIC BACTERIA IN SMOKED MACKEREL

By

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ABSTRACT

Control samples of hot smoked Spanish mackerel (*Scomberomorus commersoni Lacapede*), and also samples which had been contaminated with the following seven microrganisms (*Vibrio parahemolyticus* (NC-10903), *Vibrio cholera*, *Listeria monocytogenes* (NC-11004), *E. coli* (NC-09001), *Salmonella typhimurium* (NC-0074), *Salmonella derby*, and *Staphylococcus aureus* (NC-08532) were irradiated at doses of 0, 1, 2, 3, 4 and 5 kGy. They were subsequently stored at ambient and refrigerated temperature. The irradiation dose required to eliminate all seven microrganisms was 4 kGy even at levels of contamination up to 10^8 cfu. This dose also extends the shelf life during storage at 8°C ($\pm$1°C) for one month. Peroxide value (PV), TVB and other indices were slightly increased in low temperature storage.

The objectives of the research were:

- to find a specific combination of factors to extend shelf-life of hot smoked fish;

- determine the irradiation doses to eliminate pathogens.

UTILIZATION OF CAWTAIL RAY MEAT FOR KAMABOKO MANUFACTURE

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ABSTRACT

An experiment on the utilization of cawtail ray meat for kamaboko manufacture was carried out.

The effects of tapioca addition at levels of (0, 5 and 10%), sodium tripolyphosphate addition levels (0, 0.2, and 0.4%) and storage at 5°C on the product quality and stability was investigated. During storage, kamaboko was analyzed for moisture, TVB, TBA, urea content. In addition, elasticity, total plate count, sensory properties of the product were also observed during storage. The results showed that the best product could be produced by using 5% tapioca and 0.4% STPP. While tapioca and STPP addition prolonged the shelf life of kamaboko. Meanwhile the shelf life of kamaboko produced during the experiment was in the range of 20-35 days.

EXTENSION OF THE SHELF LIFE OF AMBUL THIYAL

By

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ABSTRACT

"Ambul Thiyal" a traditional tuna fish curry in Sri Lanka has a shelf life of around 7 days at ambient temperature. The curry is prepared and stored in the same clay pot using salt, pepper and malabar tamarind (*Garcinia cambogia*) as ingredients. The marketability of this product as a cottage industry has been restricted due to fungal infestation. Hence food preservatives and cheaper packaging material were tried out to extend the shelf life of the product, enabling it to be marketed by small-scale producers.

Potassium sorbate, sodium propionate and sodium benzoate were tried out at their maximum permissible levels using clay pots. The most effective preservative was selected and polyethylene and polystyrene containers were tested as alternative packaging material. The storage conditions tried out were ambient, refrigeration, and frozen. The quality changes of the product were determined by sensory evaluation, total bacterial and mould count.

The average pH and moisture contents of this product were 4.83 and 52%. Moulds appeared on the 4th day in the untreated samples stored in clay pots at ambient temperature whereas the samples remained free of moulds for 4, 5 and 12 days when treated with 0.32% sodium propionate, 0.1% sodium benzoate and 0.2% potassium sorbate respectively. The shelf life of the product packed in polyethylene bags and treated with 0.2% potassium sorbate varied from 6 to 34 days at ambient and refrigeration conditions. Ambul thiyal stored in polystyrene containers at ambient temperature was not infested by moulds till the 14th day while they remained acceptable and free of moulds even after 60 days and 75 days, when stored at refrigeration and frozen conditions.

The treatment of 0.2% potassium sorbate and polystyrene containers, as packaging material can be recommended for the inhibition of fungal growth and thereby extending the shelf life of ambul thiyal for up to 14 days at ambient, 60 days at refrigeration and 75 days under frozen conditions.

IMPROVEMENT OF QUALITY OF DRIED-SMOKED SEA CUCUMBER BY ENZYMIC TREATMENTS

By

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ABSTRACT

Presence of lime deposits on smoked-dried sea cucumber reduces quality and hence price in the market. Experiments have been carried out to find a simple method for lime removal utilizing proteolytic enzymes obtained from natural plant sources. Sources of the enzymes used were papaya (*Carica papaya, L.*) leaves and its fruit and plant tuber (*Dioscorea hispida, D.*).

The results indicate that enzymic treatments were capable of reducing lime contents of the products and therefore improving quality. The following treatments indicate degrees of efficacy of lime removal: papaya leaves, papaya fruits, tuber roots and control with average calcium contents (dry basis) 2.48%, 3.19%, 11.26% and 20.22% respectively.

The best treatment was obtained with the enzymic treatment with papaya leaves. Chemical analysis was in good agreement with organoleptic tests. However removal of lime did not cause any effect on the storage life since deterioration rates were almost equal for all treatments.

STUDIES ON THE PREPARATION OF SHRIMP PICKLES IN DIFFERENT STYLE AND THEIR ACCEPTABILITY

By

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ABSTRACT

Four different styles of shrimp pickle viz - Canadian style, South eastern style, Asian style and Regular hot style - were prepared and their acceptability assessed. All the pickles with pH less than 4.5 had low levels of viable bacteria and kept well for nine months without any adverse changes in palatability.

COLLAGEN BREAKDOWN IN TILAPIA - THERMAL CHARACTERISTICS AND SOLUBILITY OF TYPE I AND TYPE V COLLAGEN

By

Catherine Turner and John Ryder

In recent years it has been recognized that the connective tissues of fish and especially collagen, though present in small amounts, play a significant role in the texture and structural integrity of the muscle tissue. This study follows the denaturation characteristics, using differential scanning calorimetry (DSC), of dissected and extracted collagen in tilapia during storage in ice. Analysis of dissected collagen showed substantial changes in the thermal properties during the post mortem period. Using published methods, the collagen was extracted and typed. Type I and small amounts of type V collagen, reported to be of importance in structural changes in other fish species, were found in tilapia flesh. The thermal properties of these two collagen types also changed post mortem. These results will be discussed in more detail and in relation to other published results on fish collagens.

PROCESSING OF AQUATIC FOOD PRODUCTS FOR 2000 AD IN INDIA

By

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ABSTRACT

Food shortages generally caused by population explosion and failure of land based agriculture to reach a sustainable level has to be offset by supplementing with aquatic food products through intensified capture and culture of fish. In India, the quantity of fish produced is distributed for export, domestic consumption and non-food uses. The present per capita fish consumption of 3.5 kgs in India is one of the lowest and to take it up to the level of 5 kgs per year, a quantity of 4.4 million tons of fish would be required. A major portion of this has to come from the intensive culture practices. Infrastructure for post-harvest and marketing operations in the domestic sector is a weak link. Value added processing and innovative marketing of products as 'convenience food' has to be introduced. Protein recycling by converting the process waste into feed grade byproducts, importance of developing trained manpower in core technologies, the need for formulating quality standard for fish products meant for domestic consumption are discussed in this paper.

INFLUENCE OF CRYOPROTECTANTS ON THE QUALITY OF FROZEN MINCED THREADFIN BREAM *NEMIPTERUS BLECKERI* DURING FROZEN STORAGE

By

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ABSTRACT

Fresh threadfin bream (*Nemipterus bleekeri*) procured from the Tuticorin Fishing Harbour were immediately processed into minced meat and divided into four lots. To these lots cryoprotectants like sorbitol (4% w/w), ascorbic acid (0.1% w/w) and a mixture of

sorbitol (4% w/w) and ascorbic acid (0.1% w/w) were added. A sample without any treatment was kept as control. All the four samples were packed in polyethylene film of 150 gauge and kept in waxed cartons and then frozen in a plate freezer at - 40°C for 1½ hours and stored at - 20 ± 2°C. Yield rate, physical, biochemical and textural characteristics were assessed fortnightly during frozen storage. Minced meat mixed with a mixture of sorbitol (4% w/w) and ascorbic acid (0.1% w/w) showed better quality during frozen storage.

UTILIZATION OF WHEY PROTEIN CONCENTRATE AND CARRAGEENAN IN FISHBALL PROCESSING

By

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ABSTRACT

The addition of pre-gelatinized tapioca starch to fishballs resulted in products with greatly reduced gel strength and unacceptable texture. Whey protein concentrate (WPC) and carrageenan increased gel strength. Fishballs containing WPC and carrageenan had reduced expressible moisture (syneresis) after storage at 4°C for 7 days and improved freeze-thaw stability whilst maintaining gel strength, after 3 cycles of freezing and thawing. The reduction of syneresis after chilling and freeze-thawing was greater when WPC and carrageenan were used in combination, than the sum of the reduction when used separately.

EXTRACTION OF AGAR FROM SEAWEED

By

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ABSTRACT

A method which does not require sophisticated equipment in the extraction of agar from seaweed is beneficial for people with a low income to engage in as a source of self employment.

This experiment was conducted to extract agar from *Gracilaria*. Two extraction methods were compared with a view to evaluate the highest yield and the best quality.

Agar was extracted at different pH values of 4, 4,5, 5, 5,5 and 6. The quality of the product was checked by appearance (colour & lustre), moisture, crude ash and crude protein contents. The optimum pH was used to determine the optimum heating time. Agar was extracted at different heating times of 1, 2, 3, 4, and 5 hours. Three drying methods were used in comparison, electrical dryer, solar dryer and in the sun.

Extraction at pH 5 gave the highest yield (47.7%) and best quality (water content 19.5%, crude protein 2.1%, crude ash content 3.7%). The ideal heating time was 4 hours based on the yield (37.3%) and quality (gel strength 158, water content 14.6% crude protein 2.7%, crude ash content 3.9%, melting point 84.5%). Statistical difference between the three drying methods was not observed.

In this experiment optimum pH 5 and a heating time of four hours was found to be the best conditions to extract agar from *Gracilaria*. As the three drying methods were equally effective, the producer can select the technique suitable for his purpose.

WOMEN IN THE FISHERIES PROGRAM IN PAPUA NEW GUINEA

By

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ABSTRACT

An account of the marine resources, components of fisheries sub-sector, harvesting, processing and marketing, priorities and strategies of Government of Papua New Guinea (PNG) is presented in this paper.

Papua New Guinea has a coastline of 17,000 kilometres with declared fishing zone of 3.2 million km^2. The country is the third major fishing zone in the Pacific region with plenty of marine wealth resources. Approximately 2,000 species of fish, 5,000 species of molluscs and an equal number of crustacea exist in the near shore and offshore waters, some of which are targets for valuable commercial fisheries. In addition, a variety of native and introduced freshwater fish and shellfish are available for exploitation. The marine fishery resource is estimated at 400,000 tons valued at Kina 608 million per annum in the current international pricing while the exploitation is less than 31,000 tons of marine fish per year.

The paper summarizes the role of women in small-scale fisheries sector. Identification of appropriate development activities, training modules to transfer skills and knowledge through informal education package are jointly implemented by the Department of Fisheries and Marine Resources (DFMR) and Women's Division of Department of Home Affairs and Youth (DHAY). The main constraints in developing projects for rural women are highlighted.

APPENDIX A

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